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cells, but in granules differently formed in the wheat, from those in the cheat.

It is impossible to convey in words, an idea of this difference in form. In the cheat the silica granules are larger and more abundant than in wheat.

In the upper glumes of both plants there are from three to nine veins. In the wheat not more than *one* vein is bordered with stomata, in cheat *every vein* has on either side a distinct row of large stomata, and this peculiarity of structure is so distinctive that the botanist can pick from a bushel of the mixed glumes of both plants, all that belong to the cheat, without possibility of mistake. Other points of dissimilarity are obvious, but I have stated enough to make a comparison with the doubtful outgrowth.

In this doubtful outgrowth from the head of wheat I find the obliquely ending internal cells in the upper glume, in the epidermal cells, silica deposits identical in form and position with the cheat, and unlike the wheat, and every vein is bordered with a row of stomata on either side. Every morphological element of the outgrowth corresponds in form to analogous elements in the cheat. I am compelled therefore to pronounce it undoubted Bromus and not Triticum. But I would report further.

Seize now, very gently, this remarkable outgrowth, with delicate forceps, and out comes the Bromus from the Triticum, and the trick is exposed. The Bromus has been introduced into the Triticum artificially, and the cement employed to make the deception more secure still adheres in flakes to the artificial parasite, and resembles in appearances gum tragacanth. A beautiful fungus, moreover, has found a nidus in the gum solution while fresh, and is not found elsewhere on the wheat. The stem of the Bromus which was inserted into the wheat, bears on its epidermal surface minute outgrowths resembling precisely those on the corresponding parts of the plant which is separate from the wheat. Now, on *naturally* internal surfaces such epidermic outgrowths never occur; I have no hesitation, therefore, in pronouncing this specimen *cheat*, neither do I think the workman has been expert in his manipulation.

NOVEMBER 10.

The President, Dr. RUSCHENBERGER, in the chair.

Twenty-six members present.

A paper entitled "Description of a new species of Helminthophaga," by Harold Herrick, was presented for publication.

Mountain Drainage of Eastern Tennessee and Western North Carolina. Ancient Burial Custom.—JOSEPH WILLCOX made some statements in reference to the drainage of the mountain region of

Eastern Tennessee and Western North Carolina. The Blue Ridge there attains its greatest development, both in width and altitude; its width being from 50 to 70 miles, while more than 30 of its peaks attain an altitude exceeding 6000 feet. The western border range, called the Smoky Mountains, is as high as the eastern range, styled the Blue Ridge; yet all of the streams that drain this region flow to the west, cutting deep gorges through the Smoky Mountains. Having visited this region on several occasions recently, Mr. Willcox observed that the eastern and central portions of it consist of gneiss rocks, while the western portion is composed of other sedimentary rocks. It is presumed that the former was upheaved at a time long anterior to the elevation of the latter, and the drainage system, having once been established to the westward, continued its erosion during the subsequent elevation of the Smoky Mountains.

Mr. Willcox also stated that when recently in North Carolina his attention was called to an unusual method of burial by an ancient race of Indians in that vicinity. In numerous instances burial places were discovered where the bodies had been placed with the face up, and covered with a coating of plastic clay about an inch thick. A pile of wood was then placed on top and fired, which consumed the body and baked the clay, which retained the impression of the body. This was then lightly covered with earth.

Notice of Remains of Titanotherium.—Prof. LEIDY directed attention to two fossils recently received through Prof. Hayden. They consist of an isolated last lower molar tooth and a lower jaw fragment containing three teeth. The specimens are part of a skeleton, most of the bones of which were found about one hundred miles east of Greeley, Colorado.

The last lower molar tooth is identical in character with that referred to *Titanotherium Proutii* (*Ancient Fauna of Nebraska*, pl. xvii. figs. 8, 9, 10), except that its outer basal ridge is less well developed. The fore and aft diameter of the crown is three and one-quarter inches; the width in front 19 lines.

The teeth of the lower jaw fragment are either the last three premolars, or the last two of these and the first molar. They are like the corresponding teeth of *Titanotherium Proutii*. In all, the crowns are bilobed. The series of three teeth measures, fore and aft, four inches and five lines. The first of the series measures, fore and aft, 14½ lines; the second 16¼, and the third 21 lines. A large mental foramen is situated about an inch and a half below the interval of the anterior two teeth.

These remains I suspect to belong to the animal indicated under the name of *Megacerops coloradensis* (*Extinct Vertebrate Fauna* of the Western Territories). This, from all the evidence I have thus far seen, appears to be of the same genus as *Titanotherium*, to which I also suspect the genus *Brontotherium* of Prof. Marsh, and the genera *Symborodon* and *Miobasileus* of Prof. Cope belong.

Last summer, in passing through New Haven, I had an opportunity of seeing the fossils referred by Prof. Marsh to *Brontotherium*. Among them I saw an incisor tooth, which is like one in the museum of the Academy. The latter specimen accompanied some remains of *Titanotherium* from White River, Dakota. The crown forms an irregular hemisphere, and measures from 5 to $5\frac{1}{4}$ lines in diameter.

The examination of the skull, described by Prof. Marsh, under the name of *Brontotherium*, and an inspection of the skulls, exhibited to the Academy last June by Prof. Cope, and referred by him to *Symborodon*, confirmed my suspicion that these two named genera are synonymous with *Titanotherium*. I also suspect from the cursory examination of the specimens of Profs. Marsh and Cope, that the number of species will probably be reduced to one or two.

Notices of Rhizopods.—Prof. Leidy exhibited drawings of the beautiful Actinophryan, *Clathrulina elegans*, described by Cienkowski and other European naturalists. It was found abundantly on Utricularia, at Absecom, New Jersey. The more mature specimens have a brownish or yellowish color. The spherical, fenestrated, siliceous shell measures from $\frac{1}{28}$th to $\frac{1}{25}$th mm. in diameter. The interior Actinophrys-like body is about $\frac{1}{30}$th mm. in diameter, and gives off a multitude of delicate rays which extend through the fenestra of the shell. The stem of attachment of the shell measures $\frac{1}{4}$th of a mm. or more in length.

The maturer specimens frequently have others attached to their shell, usually one, but as many as six were observed radiating on their slender stems from the parent shell. These secondary shells are slightly smaller than the others, are colorless, and often so delicate and transparent that the fenestrate character, if it exists, is invisible.

In a number of detached specimens of *Clathrulina*, the shell was occupied by a central, rayless, granular mass, from $\frac{1}{80}$th to $\frac{1}{60}$th mm. in diameter.

Prof. Leidy also exhibited drawings of *Actinosphærium Eichhornii*, which, though not so common as *Actinophrys sol*, is frequently found in the ponds and ditches in the vicinity of Philadelphia. It varies considerably in size, ranging from $\frac{1}{12}$th mm. to $\frac{2}{5}$ mm. in diameter. Some exhibit a multitude of rays, others a few, and some observed, of large size, alive and active, were utterly rayless.

Drawings were also exhibited of *Acanthocystis viridis*. This remarkable rhizopod occurs frequently in all the ponds and ditches in the vicinity of the city. It is either very polymorphous, or else perhaps several species may be included under the one name.

Some are green from the chlorophyl balls occupying the superficial part of the body. Others exactly alike in all other points of structure are colorless. From the body project a multitude of exceedingly delicate spines with discoid bases and furcate ends. Rays also like those of *Actinophrys* project beyond the spines. Both rays and spines in the immediate vicinity of the body are enveloped in a stratum of exceedingly minute vibrio-like spicules. The green specimens of *Acanthocystis*, independently of rays and spines, measure about $\frac{1}{10}$th mm. in diameter; the colorless ones measured about one-half the size of the former.

Drawings were also exhibited of an Actinophryan, of which a number of individuals lived together in colonies. These are not unfrequently met with in the same positions as *Acanthocystis* and *Actinosphærium*. The species appears to be the same as that recently described by Hertwig and Lesser, in the *Archiv fur Mikroskopische Anatomie*, 1874, plate iv. fig. 1, under the name of *Raphidiophrys elegans*. I have repeatedly met with the creature in colonies from half a dozen up to forty. The whole colony moves along with much greater rapidity than *Actinophrys sol*. The individuals measure $\frac{1}{26}$th mm. in diameter, and project a multitude of rays extending to $\frac{1}{5}$th mm. in length. In colony the bodies are conjoined by bridges or isthmi, through which chlorophyl balls and granules incessantly but slowly pass from one to another. The bodies and the bases of the rays are enveloped in an atmosphere of exceedingly delicate semicircular spicules. The animals take their food in the same manner as *Actinophrys sol*. A colony of thirty-eight was observed to break up into three separate colonies numbering severally fifteen, ten, and thirteen, each of which moved away in a different direction.

Drawings were exhibited of *Amœba quadrilineata*, Carter, a common species in the waters in the vicinity of Philadelphia. It is about $\frac{1}{15}$th mm. in length by $\frac{1}{40}$th mm. in breadth. The species is remarkable especially for the retention of the four delicate longitudinal folds in all its movements.

Drawings of two other species of *Amœba* were exhibited, which are supposed to differ from those previously described. They were characterized as follows:—

AMŒBA VIRIDIS.—Bright green from the multitude of contained chlorophyl balls. Form of body irregularly stellate, with thick conical pseudopods projecting in all directions. Sarcodic substance colorless and finely granular. Neither nucleus nor vacuoles were observable. Movements slow. The body occupied a space of about $\frac{1}{10}$th mm. The chlorophyl grains are nearly of uniform diameter and measure the $\frac{1}{250}$th mm. Absecom Pond, New Jersey, Nov. 5, 1874.

AMŒBA TENTACULATA.—Body spheroidal, oval, or limaciform, projecting a multitude of long, conical, or fusiform pseudopods of clear ectosarc, into which no granules of the entosarc enter; posteriorly finely papillate, or with a discoid papillate subdivision Exterior of the body colorless and transparent; interior of the body, or entosarc, yellowish, and spotted brown or green from the food contents. When moving the animal resembles a sea-slug, Eolis, in its shape and from its many long pointed pseudopods. At the fore part of the body, in progression, a large extent of perfectly clear ectosarc precedes the entosarc, equal to about one-sixth the length of the body. This is blunt in front, and with its divergent pseudopods resembles the head of a slug. When floating the animal looks like a large *Actinophrys* with thick conical rays. The animal is voracious, and feeds on desmids, diatomes, and diffuse granular and flocculent vegetable matter. Length of the body from $\frac{1}{5}$th to $\frac{1}{4}$th mm; breadth $\frac{1}{12}$th to $\frac{1}{8}$th mm. The pseudopods up to $\frac{1}{16}$th mm. long by $\frac{1}{125}$th mm. thick. Absecom Pond, New Jersey. Frequent from September to November.

On Supposed Spermaries in Amœba.—Prof. LEIDY stated that in an examination of a large *Amœba*, from Absecom Pond, N. J., he had observed a point of structure which he had not previously noticed in any of the species. The *Amœba* generally assumed a globular or oval form from the $\frac{1}{10}$ to the $\frac{1}{8}$ of a line in diameter. It projected from any part of its circumference digitiform pseudopods up to $\frac{1}{24}$ of a line by the $\frac{1}{160}$ of a line thick. The granular matter of the entosarc was mingled with a multitude of brown food balls, and numerous crystals, most of which appeared to be of isometric forms. The coarser granules of the entosarc rarely entered even the base of the pseudopods.

The uniformly granular nucleus, immersed in the entosarc, measured about $\frac{1}{40}$ of a line in diameter. The contractile vesicle measured $\frac{1}{22}$ of a line. With a $\frac{1}{10}$ immersion objective lens, there were observed around the circumference of the contractile vesicle, half-a-dozen granulated spheres, from $\frac{1}{120}$ to $\frac{1}{85}$ of a line in diameter. The granules of these spheres appeared to be of uniform size, and exhibited an active swarming movement, resembling the motion of spermatozoids. I could not isolate the spheres to examine them more definitely, nor could I detect the ordinary spermatozoid form among the closely swarming granules. I have suspected that these granular spheres were spermaries? After having detected them with the $\frac{1}{10}$ objective lens, I could barely see them with the $\frac{1}{5}$ objective.

On the Geology of Certain Lands in Ritchie and Tyler Counties, W. Va.—Prof. PERSIFOR FRAZER, Jr., asked the attention of the meeting while he described, as follows, the geological features of two tracts of land in Ritchie and Tyler Counties, W. Va., belonging to the Academy, and which he had recently been requested to examine as an expert. The tract in Ritchie County *exclusively* comprises a tolerably regular parallelogram, whose sides run north-east and northwest, and whose area includes about seventeen hundred and eighty-seven acres, divided into unequal parts, both by the Hughes River and by the Baltimore and Ohio Railroad. The north angle of the property is distant about half a mile from the station of Cornwallis on the above railroad.

The lands themselves resemble in general character thousands of square miles of territory both in West Virginia and Pennsylvania, which are situated in the coal measures. They may be described as very thick deposits of sandstone and shale through whose almost horizontal strata the numerous small streams have cut precipitous ravines to a depth of three hundred and fifty or four hundred feet. The soil, which is what is known in that part of the country as "white sand soil," is generally light and poor, and, except in the alluvial bottoms, unsuited to the production of fine cereal crops.

These hills and plateaus are covered with forest vegetation of different kinds, the most abundant representatives of which are white, red, and black oak, chestnut oak, poplar, beech, hickory and ash, white and yellow pine. Locust is almost unknown on the tract near Harrisville, though frequently met with in the northern part of the county. The greatest value of the land is for its production of white oak and poplar, especially the former, which is cut into railroad ties and barrel staves.

Both the Harrisville and the Tyler County tracts are situated upon the so-called coal measures of West Virginia, and the former of these is about ten to fifteen miles east of the town of Petroleum. So far as the mineral resources of this property (the Harrisville tract) are concerned, the excitement which a few years ago was allayed after an enormous expenditure of money in futile efforts to procure oil in the district embracing Ellenboro', Harrisville, and Cornwallis, furnishes us with the means of making a very fair estimate of them. Nothing but oil, coal, iron ore, or clay is to be anticipated, and the very numerous bore-holes sunk to procure the first of these presents us with seven hundred and fifty feet of measures, in no horizon of which is there a workable bed of coal. The formation, with its plates of sandstone and shale, is almost horizontal, and rolls gently east and west with a dip of 2° or less; and though different sections of these hills varied the order of recurrence of their sandstone, flags, and shale, the position of the only coal seam found was constant, and near the beds of the streams. The coal bed was opened along a small run entering the south corner of the Harrisville tract in several places. In order to ascertain the true position of this deposit with reference to the rocks on the property which lie about one-quarter of a mile northwest of the largest opening, a line was run connecting together the south corner of the tract, the bore-hole, and this opening. This line was only a rough approximation to the truth, the distances being obtained by pacing, and the altitudes by the eye, but it was clearly evident that the coal underlay the whole tract where it had not been washed out by the streams. I could obtain no exact information as to its value nor even a fair sample of it, the excavations having been nearly filled with dirt. If this bed should prove to be the same as that opened near Ellenboro', it will probably average from fourteen inches to eighteen inches in thickness and may be of good quality, but cannot for many years add any great value to the lands under which it occurs. This is the only coal of which anything is known, although the bore-hole of which I am about to speak developed a bed of black slates at a much lower level.

The bore-hole alluded to was sunk by Mr. Moats, and lies about three hundred feet inside the southeast property line, and about thirty feet north of the road. The record of this exploitation was, as usual, not kept, and the account which follows, taken entirely from remembrance of the alternation of strata, must be accepted with great allowance, and is rather valuable as indicating what was *not* found than for any positive results ascertained.

Shales and loose stuff (?)	50 feet.
Very hard white rock "like marble" without grain, only got through three or four inches in a day . . .	4 "
Sand rock, black slates, sand rock and fire clay . .	? "
"Soap stone" (*i. e.* soft slaty rock)	8–10 "

Beneath the black shales occurred a sand rock of which there were three in all.

At three hundred feet enough oil was reached to see and smell, and it seemed of good quality.

Starting from a station high up the hill at the southern corner of the property, a rough section gave:—

? covered with debris		70 feet.
Reddish-gray sandstone	? feet	70 "
?	? "	
Greenish sand rock	? "	80 "
?	? "	
Massive plate of sandstone		30 "

Flat sandstone in bed of creek.

This brings the rocks down to about the level of the bore-hole, and renders it probable that the first fifty feet through which the hole was sunk included the first sand rock.

It will be remarked that in the section here described no place is given to the eighteen-inch coal bed, which occurs a little higher up the run. Its position is to be looked for in the fifty feet through which Mr. Moats first passed. He may not have noticed it; or he may have forgotten it; or (which is very probable) these fifty feet below the general level of the bank of the run may consist of loose debris which the stream has torn out and scattered along its course where the soft coal would have disappeared.

It would be disloyal to science to hazard an opinion on the true horizon of these measures without the most careful instrumental work, and a thorough comparison of the labors of the Pennsylvania and Ohio geologists, as well as the more recent sections of Stevenson and White.

It has been stated that the measures are almost horizontal, having a dip of about 2° or less from low axes, which are generally north and south. Mr. I. C. White, in his preliminary introduction to his "Notes on the Upper Coal Measures of Western Virginia and Pennsylvania," read before the Lyceum of Natural History of New York, and reprinted from their *Annals*, speaks of the " Dividing Ridge" as a watershed between the tributaries of the Monongahela and those of the Ohio, which occupies the median line of a gentle anticlinal axis which passes across the coal measures from north to south.

There are, without doubt, many of these gentle north and south axes in the southwestern coal measures—at least in Tyler, Ritchie, and Pleasant Counties, and one of them on the western limits of the Academy's Harrisville tract sheds the oil as well as the water.

Geologically there seems to be no reason to expect any great development of mineral resources.

Tyler County Tract.—During the entire time occupied by the examination of the lands of the Academy, extensive forest fires prevailed, and the whole region was densely clouded with smoke, which not only made it impossible to get any extended view of the country, but so completely obscured the sun that at 3 P.M. it was not possible to indicate its position in the sky. This smoke shortened the day and prevented me from visiting certain tracts where the fires were prevailing.

The so-called Tyler County tract lies across the border of Tyler and Ritchie Counties, from the headwaters of the largest tributary to McKim Creek, across the " Dry Ridge" to the banks of Hughes River. It contains more bottom and, therefore, more arable land than the Harrisville tract, and what parts have not been settled on contain an abundance of fine timber.

What I have said of the structure of the Harrisville tract applies largely to that of the Tyler County tract, though the poverty of the country in coal in the latter must be assumed on different grounds from that of the former, where numerous borings made in the search after oil served to show the absence of coal within a reasonable distance below the surface; while *here* there are no such exploitations.

About three miles south-southwest of the lower corner of the Tyler-Ritchie tract, on the property of Mr. Campbell I discovered a thin bed of coal, which, from what I could learn, agreed in general description with the thin seam opened in the base of the hills near Ellenboro'. It would be rash to generalize, from a hurried observation of a bed beneath the surface of a run, a continuity with the Ellenboro' bed eight miles distant, but so far as I could carry the measures southward by a rapid transit over them, they bore out the identity. If this be truly the same thin seam which crops out near Ellenboro', and which I have supposed to be the same as that on Mr. Moat's farm, there is no difficulty in prophesying an absence of coal and oil from these Tyler County lands. If the seams are not the same the structure must be so complicated as to need a special study. The chances, however, are very much against the existence of valuable mineral deposits on the Tyler-Ritchie tract.

Prof. Lesley remarked that he had not had an opportunity to speak with Prof. Frazer before the presentation of his report, but that he had seen Mr. Stevenson lately, who informed him of a very important observation which he had made in the region of the Harrisville tract.

Mr. Stevenson had satisfied himself of the existence of a fault on the Hughes River which brought up the lower measures horizontally against the middle barren group of coal measures which lay westward of them.

Prof. Lesley regretted the absence of Mr. Stevenson, who could of course much better explain his own views on this subject, but he believed that this fact had a most important bearing on the geology of the whole region.

Prof. Frazer asked how the horizontal structure of this faulted district could be satisfactorily accounted for; to which Prof. Lesley replied that it would necessitate the supposition of a vertical drop of the region west of a north and south line of fracture parallel to, and perhaps synonymous with, the "Oil Break" anticlinal, which is only a few miles further west.

In reply to a question as to his opinion of the probability of the sandstone of the downthrown region being the representation of the Mahoning sandstone, Prof. Lesley said that he understood Prof. Stevenson to hold that opinion.

The Committees to which they had been referred recommended the following papers to be published:—